



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 09/990,317 | 11/23/2001 | Morgan Grover | A-7200.RNFMP/cat | 2646 |
| 20741 | 7590 | 06/13/2005 | EXAMINER | |
| HOFFMAN WASSON & GITLER, P.C CRYSTAL CENTER 2, SUITE 522 2461 SOUTH CLARK STREET ARLINGTON, VA 22202-3843 | | | VO, HUYEN X | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2655 | |

DATE MAILED: 06/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|---------------------------------------|--|
| Office Action Summary | Application No. 09/990,317 | Applicant(s) GROVER, MORGAN | |
| | Examiner Huyen X Vo | Art Unit 2655 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 15-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 15-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments have been fully considered and are persuasive. The previous ground of rejection has been withdrawn in favor of a new ground of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 15-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (Signal Processing Publication) in view of Johnson (US 6415253).
4. Regarding claims 15 and 33, Lee et al. disclose a method of and system for extracting an information signal from input signal containing both the information signal and noise, including the steps of: estimating a non-Gaussian distribution function model for the information signal (*pages 4-10, the E step in the EM algorithm performs estimation*); dynamically updating said non-Gaussian distribution function model for the information signal (*pages 4-10, the EM algorithm disclosed is an iterative process*); estimating the information signal using estimation-maximization algorithm (*pages 4-10, EM algorithm*); obtaining the estimated information by filtering the information signal

Art Unit: 2655

through a Kalman filter (*see abstract and/or pages 4-10, in summary, Lee et al. disclose a non-Gaussian autoregressive (AR) model for speech signals and models the distribution of the driving-noise as a Gaussian mixture, with application of a decision-directed nonlinear Kalman filter*).

Lee et al. fail to specifically disclose decomposing the input signal into multiple spectral bands; producing a gain function for each of said spectral bands; applying said gain function for each of said spectral bands to the input signal spectral bands to produce estimated information signal components for each of said spectral bands; and combining said estimated information signal components for all of said spectral bands to produce an estimate of the information signal with reduced noise. However, Johnson teaches decomposing the input signal into multiple spectral bands (*col. 9, lines 6-67, signal is processed on a subband-by-subband basis*); producing a gain function for each of said spectral bands (*figure 4 and/or col. 13, line 38 to col. 15, line 27*); applying said gain function for each of said spectral bands to the input signal spectral bands to produce estimated information signal components for each of said spectral bands (*figure 4 and/or col. 13, line 38 to col. 15, line 27*); and combining said estimated information signal components for all of said spectral bands to produce an estimate of the information signal with reduced noise (*figure 4 and/or col. 13, line 38 to col. 15, line 27 and/or IFFT module 26 in figure 1*).

Since Lee et al. and Johnson are analogous art because they are from the same field of endeavor, it would have been obvious to one of ordinary skill in the art at the

Art Unit: 2655

time of invention to modify Lee et al. by incorporating the teaching of Johnson in order to enhance noise-corrupted speech through noise suppression.

5. Regarding claims 19-21 and 25, Lee et al. further disclose the step of estimating current information signal power and current noise power (*the E step in the EM algorithm performs estimation using information of the previous frame*), and the step of estimating current probability of information signal presence (*equation 6 and/or 7 on page 4*).

6. Regarding claims 29 and 34-36, Lee et al. further disclose the steps of: estimating current information signal power based on input signal power, prior information signal power, noise up power, and probability of information signal presence (*pages 4-10, referring to the EM algorithm*); estimating current noise power based upon input signal power, information signal power, prior noise power, and probability of information signal presence (*pages 4-10, referring to the EM algorithm*); and estimating current probability of information signal presence based upon input signal power, information signal power, noise power, and prior probability of information signal presence (*pages 4-10, referring to the EM algorithm*).

7. Regarding claims 16, 22, 26, 30, and 37, Lee et al. further disclose that said non-Gaussian distribution function model for the information signal is a Gaussian Mixture Model (*first column in section 2 page 4*).

8. Regarding claims 17-18, 23-24, 27-28, 31, and 38, Lee et al. fail to specifically disclose that the decomposing step uses Fourier transforms. However, Johnson further teaches that the decomposing step uses Fourier transforms (*FFT module 18 in figure 1*). Since Lee et al. and Johnson are analogous art because they are from the same field of endeavor, it would have been obvious to one of ordinary skill in the art at the time of invention to further modify Lee et al. by incorporating the teaching of Johnson in order to enable the system to perform spectral processing and spectral subtraction to improve speech quality.

9. Regarding claims 32 and 39, Lee et al. further disclose that said non-Gaussian distribution function model for the information signal is a Gaussian Mixture Model (*first column in section 2 page 4*).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wu et al. (US 6408269) disclose a frame-based subband Kalman filtering method for speech enhancement that is considered pertinent to the claimed invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Huyen X Vo whose telephone number is 571-272-7631. The examiner can normally be reached on M-F, 9-5:30.


Art Unit: 2655

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wayne Young can be reached on 571-272-7582. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HXV

6/7/2005


SUSAN MCFADDEN
PRIMARY EXAMINER